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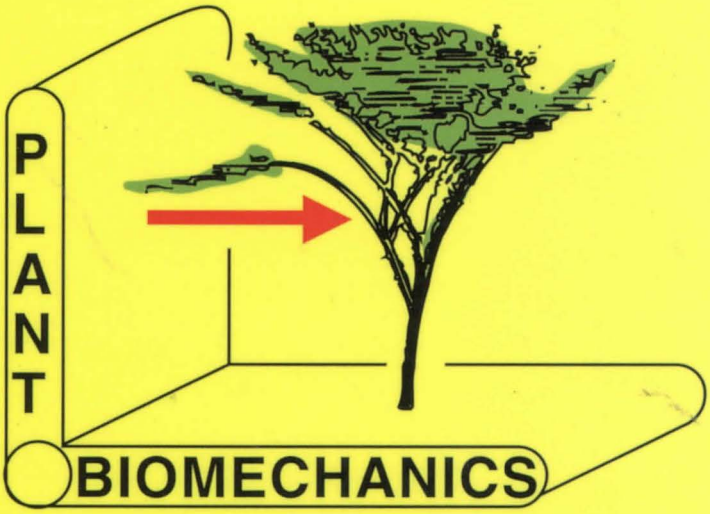

Résumés – *Summaries*

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WOOD STRUCTURE, CHEMICAL COMPOSITION AND GROWTH STRAINS IN *EUCALYPTUS* CLONES. INTERPRETATION OF THE NOTICED PHENOMENONS

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The longitudinal residual growth strains at the stem surface, named **L**ongitudinal **R**esidual **S**train of **M**aturation (**LRSM**), is appraised by stresses ("growth stresses") release on stem periphery by means of cutting in the wood [1], [4], [5]. The measurement of Longitudinal Residual Strain of Maturation allowed a continuous and quantitative classification of wooden samples coming from hybrid clones of *Eucalyptus* (Congo, Africa). This kind of measurements allows a mechanical identification of tension wood. In *Eucalyptus* species, it is not characterised by G-fibres, it can be however characterised by its growth strains [1].

The relationships between wood structure and mechanical properties were studied by ultrastructural (**M**icro**F**ibril **A**ngle = **MFA**) and chemical (quantitative investigation of the monomeric compound of lignines by thioacidolysis [6]).

The results presented in this study show :

- an important variation of the LRSM with high values, in spite of the weak eccentricity, the good verticality and the absence of G-fibre of our trees (Fig 1)
- a negative correlation between the level of the LRSM, the lignin content (Klason lignin) and the MFA (Fig 2 and 3)
- a positive correlation between the level of the LRSM and the ratio of the lignin monomeric units rates: syringyl on guaiacyl (S/G ratio) (Fig 4).

The weak knowledge about the effects of quantitative and qualitative variations of lignins on the phenomenons involve in physical and mechanical caracteristics of wood don't allow us an interpretation of this observation.

The signification of these correlations can be discussed as a biochemical problem: are there direct mechanical causality or more intricate correlations between structural variables ?

Some micro-mechanical models allow the expression of the longitudinal deformation of maturation at the scale of the cell wall in terms of two biochemical phenomenons (Fig 5 et 6) :

- The swelling of amorphous matrix typical of the lignification [3], the deposition of encrusting lignins between cellulose fibrils causes transverse expansion, because of the lateral links between fibrils, the transverse expansion is associated with longitudinal contraction.
- The contraction of the microfibrils typical of the crystallisation process of cellulose with simultaneous polymerisation due to a high degree of lateral order in the crystals [2].

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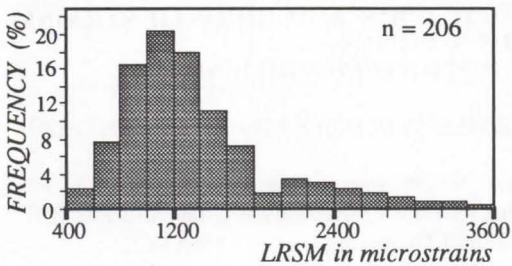

Fig 1 : values distribution of the LRSM
(LRSM are shrinkages expressed here in absolute value)

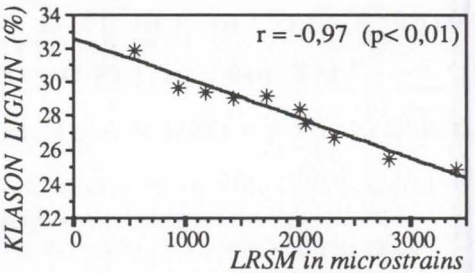

Fig 2 : relationship between Klason lignin rate and LRSM

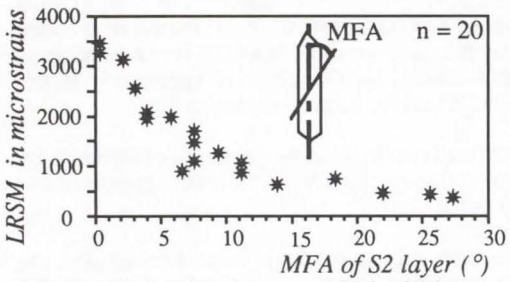

Fig 3 : relationship between MFA of S2 layer and LRSM

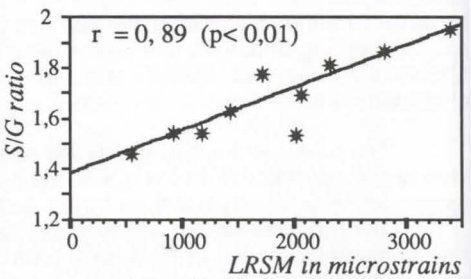

Fig 4 : relationship between S/G ratio and LRSM

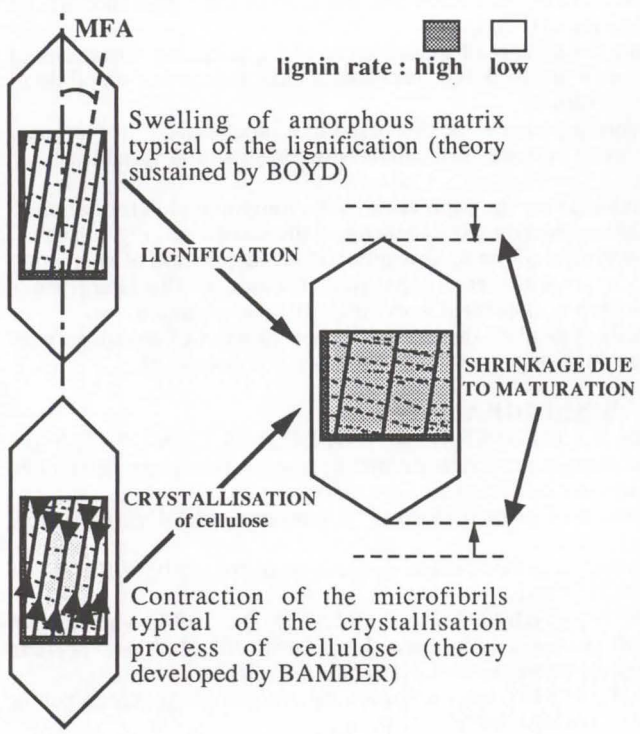

Fig 5 : the origin of the longitudinal deformation of maturation at the scale of the cell wall can be expressed in terms of two biochemical phenomenons.

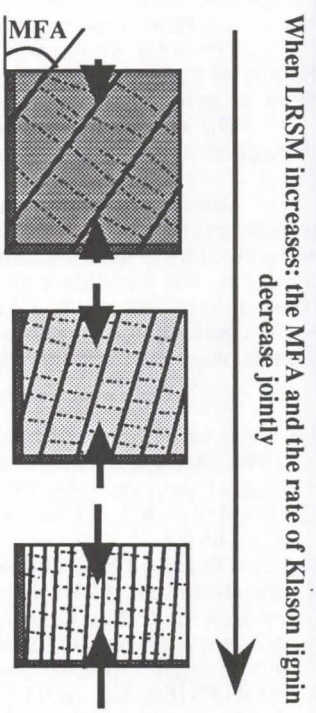

Fig 6 : Schematic representation of the mechanical and histological observations.